



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

**William McKee Doane
and Steven William Doane**

Confirmation No. 5971

Application No. 10/762,956

Filed: January 21, 2004

For: **METHODS OF FORMING
SUPERABSORBENT POLYMER
PRODUCTS FOR USE IN
AGRICULTURE**

Group Art Unit: 1711

Examiner: Thao T. Tran

Date: February 22, 2005

37 C.F.R. § 1.132 DECLARATION OF DR. WILLIAM M. DOANE

TO THE COMMISSIONER FOR PATENTS:

I, William M. Doane, declare as follows:

1. I am an inventor named in the above-identified patent application.
2. I reside at 448 South Montana Avenue, Morton, Illinois 61550-2732.
3. In 1952, Purdue University of West Lafayette, Indiana, awarded me a Bachelor of Science degree. In 1963, Purdue University of West Lafayette, Indiana, awarded me a Ph.D. in biochemistry.
4. From 1963 until 1994, I was employed by the ARS National Center for Agricultural Utilization Research of Peoria, Illinois, where I conducted research relating to polymer chemistry, organic chemistry, and natural products chemistry. From 1970 – 1980, I was the Research Leader of the Starch Products Research department. From 1980 – 1985, I was the Laboratory Chief of the Biomaterials Conversion Laboratory. From 1985 until 1994, I was the Research Leader of the Plant Polymer Research department of the ARS National Center for Agricultural Utilization Research.
5. While employed by the ARS National Center for Agricultural Utilization Research, I initiated a research program that led to the discovery of highly absorbent starch graft copolymers. In 1975, I was awarded the Industrial Research (IR) Award (awarded to

each of the inventors of the 100 most significant and useful products in the world) for my research and discovery. In 1976, I was awarded the Inventor of the Year Award by the Association for the Advancement of Inventions and Innovations (awarded to the most significant patent issued that year) for the patent relating to my research and discovery.

6. In 1993, I was awarded the Alsberg-Schoch Memorial Award from the American Association of Cereal Chemists for outstanding research and development in furthering starch science.

7. In 1971, I was the editor of the publication *Polysaccharide Chemistry*.

8. In November of 1995, I was inducted into the Science Hall of Fame.

9. In 1999, I was awarded the Melville L. Wolfram Award by the American Chemical Society's Division of Carbohydrate Chemistry for distinguished service to the field of Carbohydrate-Chemistry.

10. I am listed in the following Who's Who publications: (1) Who's Who in American Men and Women of Science, (2) Who's Who in Technology Today, and (3) Who's Who in Frontier Science Technology.

11. I have authored over 200 scientific articles, primarily in the disciplines of polymer chemistry, organic chemistry, and natural product chemistry.

12. I am a named inventor on over 25 U.S. patents. Technologies disclosed in most of these patents are being practiced commercially under licensees from the US government.

13. Additional recognitions that I have been awarded include: three Distinguished Service awards and two Superior Service Awards from the Department of Agriculture, four ARS Technology Transfer Awards, two Federal Laboratory Consortium Technology Transfer Awards, and the Corn Industry Award from the National Corn Growers Association.

14. From 1995 until 2001, I was employed by the Biotechnology Research Development Corporation where I was the Principal Scientist. While there, I researched and new biodegradable plastics containing starch. Several scientific papers were published and 13 U.S. Patents were issued resulting from these research activities.

15. From 2002 until the present, I have been employed by D2 Polymer Technologies, Inc. (the assignee of the above-identified patent application), for which I am the President and Chief Executive Officer.

16. I am also currently serving as the Director of Research and Development for Absorbent Technologies, Inc. of Portland, Oregon (the exclusive licensee of the above-identified patent application).

17. The claims (as amended by a concurrently filed amendment) of the above-identified patent application recite “granularizing the precipitated starch graft copolymer to form granules of superabsorbent polymer product sized for use in agricultural applications.”

18. In the January 11, 2005 Office action, Examiner Tran rejected claims 1-14 and 20 of the application under 35 U.S.C. § 102(b) for anticipation by Fanta et al. (“Fanta”). Specifically, Examiner Tran stated that “Fanta . . . teach[es] granularizing of the absorbent copolymer” (Office action, page 4).

19. I am an inventor named in Fanta, and I submit this declaration to explain certain teachings of Fanta as it relates to the teaching of the above-identified patent application.

20. Fanta teaches the formation of an absorbent composition in the form of a film. Fanta does not teach the formation of “granules of superabsorbent polymer product sized for use in agricultural applications,” as recited in amended claim 1 of the present application.

21. In Example I, Fanta describes Wiley-milling the film of absorbent composition through a 20-mesh screen (col. 8, lines 14-35). On page 4 of the January 11, 2005 Office action, Examiner Tran states that Wiley-milling the film of absorbent composition is the equivalent of “granularizing the precipitated starch graft copolymer to form granules of superabsorbent polymer product,” as recited in amended claim 1 of the present application.

22. The Examiner’s statement is incorrect. It is impossible to form granules of starch graft copolymer by Wiley-milling films of dried, saponified product. A Wiley mill includes several razor-sharp blades that extend from a hollow cylinder that rotates around a central shaft. In Fanta, dried starch graft copolymer films are fed into the Wiley mill such that they come into contact with the razor-sharp blades. Consequently, the size of the films is reduced. Reduction in film size does not make “granules of superabsorbent polymer product sized for use in agricultural applications,” as recited in amended claim 1. Rather, reduction in film size only makes smaller-sized films.

23. Thus Fanta does not teach “granularizing the precipitated starch graft copolymer to form granules of superabsorbent polymer product sized for use in agricultural applications,” as recited in amended claim 1 of the application. As such, Fanta does not anticipate claims 1-14 and 20 of the above-identified application.

24. Further, the Wiley-milled films of absorbent composition described in Fanta cannot be successfully used “in agricultural applications,” as recited in amended claim 1. The films of Fanta cannot be used in agricultural applications, because they (1) cannot be

applied with granular fertilizers, granular pesticides, or other granular agricultural additives; (2) cannot be applied using a granule applicator; and (3) are so brittle that transport and application of the films to a growth substrate causes them to collide and break apart to form a powder that is blown away by any wind present during their application to a growth substrate.

25. In contrast, the “granules of superabsorbent polymer product sized for use in agricultural applications,” as recited in amended claim 1, (1) can be applied with granular fertilizers, granular pesticides, or other granular agricultural additives; (2) can be applied using a granule applicator; and (3) have a bulk density that facilitates their transport and their application to a growth substrate.

26. In the January 11, 2005 Office action, Examiner Tran also rejected claims 1-14 and 20 of the application under 35 U.S.C. § 102(b) for anticipation by Jones et al. (“Jones”). Specifically, Examiner Tran stated that “Jones . . . teach[es] granularizing of the absorbent copolymer” (Office action, page 4).

27. The ARS National Center for Agricultural Utilization Research sponsored the grant that supported the research described in Jones. I was the Research Leader at the ARS National Center for Agricultural Utilization Research while the inventors listed in Jones conducted their research. Thus I am intimately familiar with the absorbent starch graft polymers described in Jones.

28. As stated at column 3, lines 8-9 of Jones, the listed inventors of Jones found the absorbent starch graft polymers available at the time of their research to have “inadequate wicking or wet-out properties.” So the inventors formulated a method of “reacting [a] hydrolyzed starch polyacrylonitrile graft copolymer with formaldehyde” to significantly reduce the wicking time (col. 3, lines 30-33).

29. Examiner Tran states that “Jones . . . teach[es] the production of [an] absorbent copolymer before adding formaldehyde” (Office action, page 4). The Examiner finds support for this assertion at column 4, lines 11-13 of Jones, which states that “the formaldehyde is reacted with the dry granular form of hydrolyzed starch polyacrylonitrile graft copolymer.” Examiner Tran asserts that the reference to a “dry granular form of hydrolyzed starch polyacrylonitrile graft copolymer” anticipates claims 1-14 and 20 of the present application.

30. Being intimately familiar with superabsorbent polymers, the research conducted by the listed inventors of Jones, and the absorbent starch graft polymers formed as described in Jones, I declare that the listed inventors of Jones did not make or have in their possession at the time of filing of the Jones patent application a granular starch graft

copolymer. This is so because, at that time, no method of forming a granular starch graft copolymer was known in the art.

31. Further, the disclosure of a “dry granular form of hydrolyzed starch polyacrylonitrile graft copolymer” in Jones is not enabled, because Jones does not describe the process by which granules of precipitated starch graft copolymer are formed.

32. The only disclosure in Jones regarding preparation of the hydrolyzed starch polyacrylonitrile graft copolymer is at column 2, lines 46-64. Pertinent parts of this disclosure are as follows. “[T]he hydrolyzed starch polyacrylonitrile graft copolymer is prepared from starch by: (1) polymerization of acrylonitrile onto starch, and (2) alkaline hydrolysis to convert the nitrile groups to carboxamide and carboxylate groups” (col. 2, lines 46-50). “Conventionally, the polyacrylonitrile portion of the starch graft polyacrylonitrile copolymer may be hydrolyzed with alkali in water after which the graft terpolymer is precipitated by the addition of methanol . . .” (col. 2, lines 56-60). “The graft terpolymer is then neutralized and dried” (col. 2, lines 61-62). Jones does not disclose a method of granularizing the hydrolyzed starch graft copolymer.

33. At column 2, lines 62-64, Jones states that “[t]he remaining details of preparing hydrolyzed starch polyacrylonitrile graft polymer are well known in the art.” As one of skill in the art, I declare that, at the time of filing of the Jones patent application, no method of forming granules of precipitated starch graft copolymer was known in the art. Thus the formation of granules of superabsorbent product was not “well known in the art.”

34. In summary, the listed inventors of Jones did not make or have in their possession at the time of filing of the Jones patent application a granular starch graft copolymer. Further, Jones does not describe a process by which granules of precipitated starch graft copolymer can be formed. Lastly a process by which granules of precipitated starch graft copolymer could be formed was not known in the art at the time of filing of Jones. Consequently, the reference to a “dry granular form of hydrolyzed starch polyacrylonitrile graft copolymer” in Jones is either in error or not enabled.

35. Consequently, Jones does not anticipate claims 1-14 and 20 of the present application.

36. Thus neither Fanta nor Jones anticipate claims 1-14 and 20 of the present application.

37. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so

made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 2-22-2005

William M. Doane
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